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AN AUTOMATIC WIND-DIRECTION RECORDER ADAPTED TO AN ELECTRICAL RECORDING THERMOMETER

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An apparatus using a Wheatstone bridge thermometer has been devised for recording wind direction. Commercial recording thermometers use expansion of gas and liquids and also the Wheatstone bridge principle in connection with a small coil of platinum wire to record temperatures. The electrical recording thermometer that was adapted for the wind-direction recorder was a 6-pole Wheatstone bridge instrument recording at half-minute intervals.

The fluctuation in the recordings of the galvanometer depends directly upon the resistance factor of the exposed platinum coil, and it would therefore be possible to insert an external variable resistance representing one complete revolution of the wind-vane shaft. Constantan wire (copper-nickel alloy) was used for the variable resistance coil, as this alloy does not vary in resistance over a wide temperature range.

The instrument here described was constructed from an automobile generator and a homemade weather vane.

The mechanism of the recording device is shown in figure 1 and the wiring diagram and a sample chart are shown in figure 2. In the construction of the recorder the field and commutator coils were first removed to provide space for the Constantan wire coil unit (A, fig. 1). The insulated commutator (B, fig. 1) and one brush (D, fig. 1) were used as the sliding contact for the resistance coil. The amount of Constantan wire necessary for maximum deflection was determined by connecting different lengths of the wire directly to the instrument. The wire was then marked in 16 units to be used as outlets to segments of the commutator. The resistance wire was then made in a coil by winding on a steel wire (No. 12). A small circular piece of hard rubber radio panel (A, fig. 1), approximately 3½ inches in diameter, was used as the support for the wire coil. Sixteen holes were bored in the outer edge of the hard rubber for small brass bolts (C, fig. 1) to be used as connectors between the marked units of Constantan wire and

the segments of the commutator. The coil unit was held rigid on the generator shaft by means of lock nuts, as shown in figure 1. Leads were soldered to the brass bolts and to the segments of the commutator. One end of the Constantan wire was grounded to the generator shaft to complete the circuit. To eliminate all possible resistance within the unit, the lower generator bearing was filled with mercury after the unit was mounted in the fixed position. Leads were then soldered to the brush and the housing of the generator. The weather vane was made from cedar wood and galvanized iron as shown in figure 1. It was necessary to redesign the tail of the vane to prevent excessive oscillations in high winds. A double tail was made by using two pieces of thin wood made to a slight wedge; e. g., if the tail of the vane is about 16 inches long, the boards should be about 3 inches apart at the rear of the wedge.

After the unit was mounted on a rigid support and leads were made to the electrical recording instrument, a small radio potentiometer (5,000 ohms) (A, fig. 2) was used to balance the unit independently of the thermometer leads. The instrument was standardized by rotating the vane and observing the true directions with a compass. The wind directions were then recorded in terms of degrees Fahrenheit. A conversion table was necessary to obtain the wind direction at any given time. Since the construction of the apparatus, it has been modified by Douglass and co-workers to give 8 direction readings instead of 16. This was done by placing a copper band divided into eight equal segments around the commutator but insulated from it. Each segment of the band was connected with the appropriate Constantan wire resistance.

The unit has been in operation for approximately 7 years with entire satisfaction.

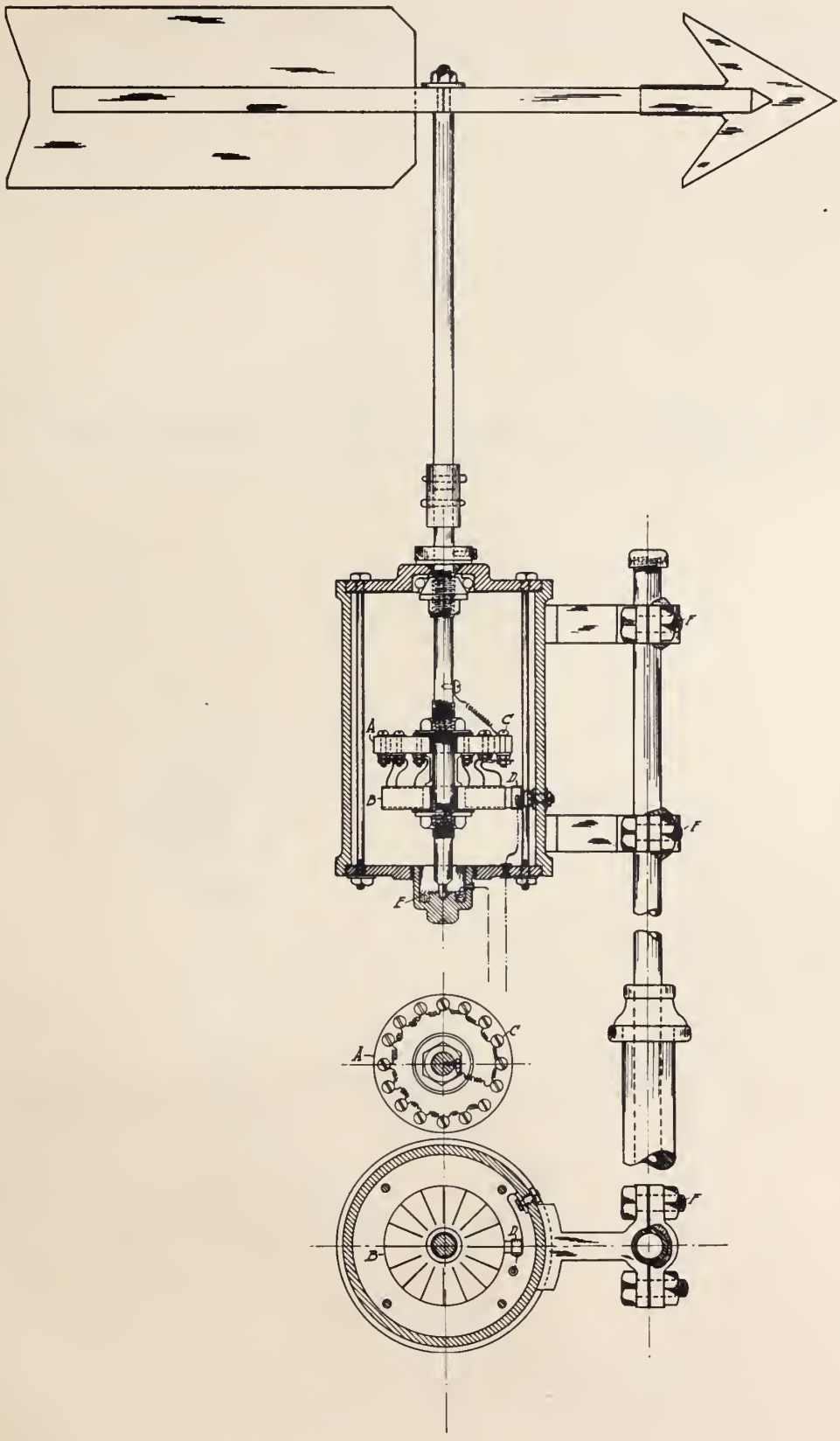
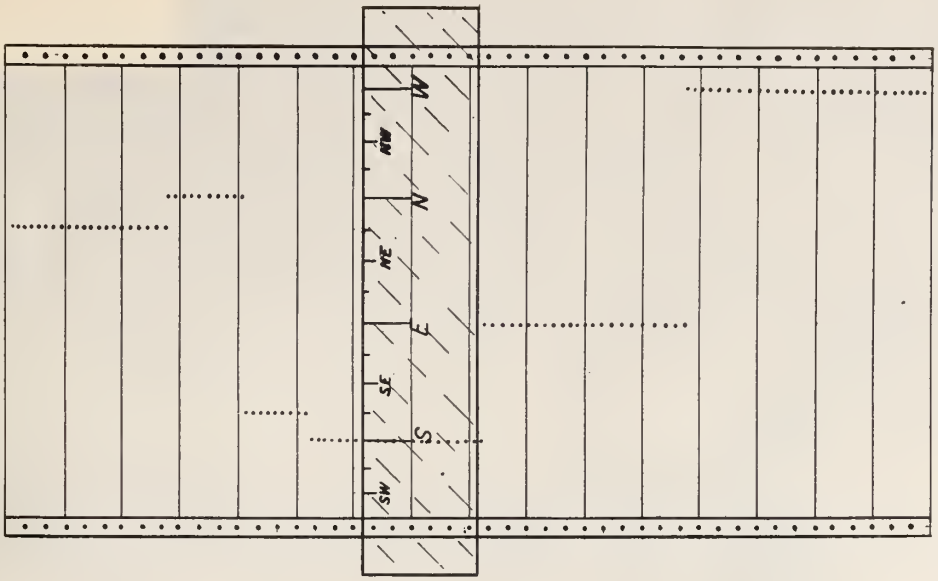


Figure 1.--Details of construction of the automatic wind-direction recorder.



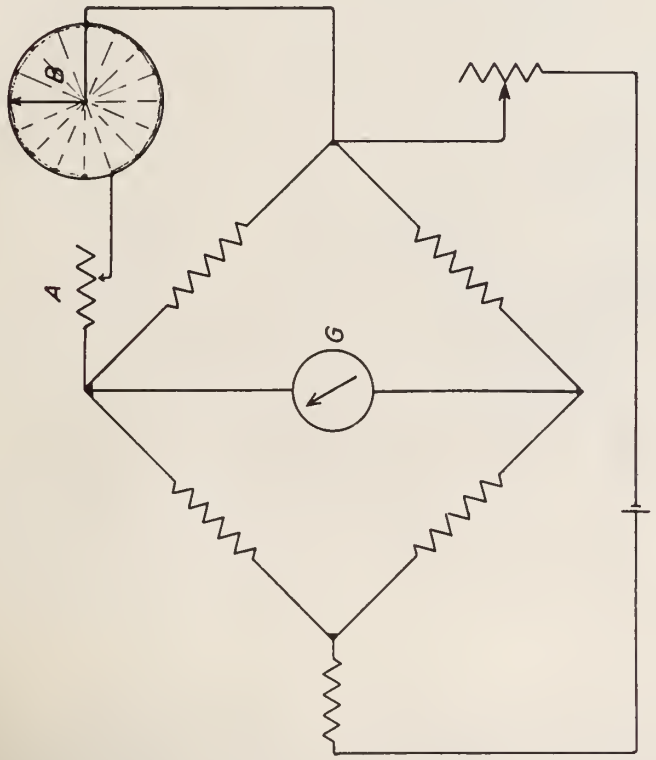


Figure 2.--Diagram of wiring (left) and sample of recording chart (right).